THE
ONTARIO WATER RESOURCES
COMMISSION

GROUND WATER SURVEY

VILLAGE OF MARKDALE

1970

Village of Markdale

Ground Water Survey

P. F. McKenna

March 24, 1970.

P. F. McKenna, P. Eng.

INTRODUCTION

At the request of the Council of the Village of Markdale, a ground-water survey was conducted within a two-mile radius of the village to locate areas where ground water could be developed as a source of municipal water supply. The report evaluates local ground-water conditions and outlines possible test-drilling areas.

Extent of Survey

Water-well records, on file with the Division of Water Resources, and soil bore-hole records were examined and geologic publications were reviewed. The logs of selected wells and soil bore holes and their relative locations are shown on Table 1 and in Drawing 2548-1, respectively.

A hydrogeologic reconnaissance field survey was conducted on March 24, 1970. Well-water samples were collected for chemical analyses to determine the quality of ground water in the Markdale area.

POPULATION AND WATER REQUIREMENTS

It was indicated by the Division of Sanitary Engineering that a population of 1,400 can reasonably be expected in the area by the end of a 20-year design period ending in 1990. Based on an average daily per capita consumption of 100 gallons and on a maximum day demand factor of 2.5, the water-supply requirement in 1990 would be 350,000 gallons per day or 243 gallons per minute.

There are no industrial users in the village; therefore, provided that sufficient storage is made available to meet peak hourly and emergency demands, a well or wells capable of yielding 250 gpm should adequately meet the water requirements of the village.

PRESENT MUNICIPAL SERVICES

The Village of Markdale has public water and sewage works systems. The source of supply for the water distribution system is a creek within the village limits. The water is treated by filtration and chlorination. A study of the Markdale water works system, completed by R. V. Anderson Associates Limited in September, 1969, described the water treatment facilities as inadequate and in need of rehabilitation.

The village municipal works include an oxidation pond and sanitary landfill site, both located west of the village and adjacent to the Saugeen River, as shown in Drawing 2548-1.

GEOLOGY

Bedrock

The Village of Markdale is underlain by two stratigraphic units of hydrogeologic importance. In the order in which they would be penetrated, they are the Guelph formation and the Amabel Group of formations, all of Silurian age.

The Guelph formation comprises tan to brown, crystalline dolomite in beds which vary in thickness from 4 to 24 inches. Much of the formation consists of dolomitized lime mud.

The Amabel Group of formations comprise massive and crystalline, porous, fossiliferous, dolomites which vary in colour from brown to blue.

The above formations are underlain by the Cabot Head formation which comprises soft red and green shale with thin interbeds of limestone, gypsum and dolomite.

Based on the logs of oil and gas wells located outside the study area, the combined thickness of the Guelph formation and the Amabel Group of formations is about 200

feet in the Markdale area. The deepest penetration of a water well into the bedrock is only about 100 feet in Well 12.

A contour map of the shape of the bedrock surface indicates that the surface is gently undulating and slopes westward from an elevation of about 1,400 feet above sea level. Regionally, there is a broad, shallow, southward trending bedrock depression which lies beneath the valley of the Saugeen River.

Overburden

The Village of Markdale is located in an area of stoney knolls and ridges composed of glacial till and sand and gravel deposits. Meltwaters associated with deglaciation incised glacial spillways into which terraces of sand and gravel were deposited. The present Saugeen River drainage system flows in the glacial spillways.

West of the Saugeen River a hummocky kame moraine was deposited which is composed of sand and gravel and glacial till.

HYDROGEOLOGY

Aquifers occur in both the bedrock and the overburden in the Markdale area. A study of drillers' logs shows that most domestic water wells obtain supplies from the Guelph formation. Sufficient water for domestic purposes

is usually obtained at shallow depths in the bedrock; therefore, there are no local hydrogeologic data with which to evaluate the aquifer potential of the Amabel Group of formations. However, investigations outside the Markdale area indicate that the Amabel Group of formations also form good aquifers.

Ground-water movement in the bedrock is deduced to occur primarily through jointing and fracture systems. The specific capacities of domestic wells in the area vary from less than 1.0 to 10.0 gallons per minute per foot of drawdown and average about 2.0 gallons per minute per foot of drawdown. It appears that drilling to depth in the bedrock could increase well yield as a larger number of joints and fractures would be intercepted. Beyond the Markdale area most large capacity wells in similar hydrogeologic settings penetrate to the Cabot Head formation.

Domestic water supplies are also obtained from the sand and gravel deposits which overlie the bedrock. The potential of these deposits to yield large supplies is unknown as the wells were not screened nor adequately developed and the saturated thickness of the aquifer is not known.

A map of the piezometric surface prepared from static water level and topographic data indicates that, under natural conditions, ground water moves under the

influence of gravity from topographically high areas towards discharge in the Saugeen River. Near flowing conditions were encountered in wells 12 and 17. Deeper wells drilled near the Saugeen River may flow because of the phenomenon of increasing hydraulic head with depth in discharge areas.

WATER QUALITY

Table 2 shows the results of chemical analyses of samples collected from selected wells. In general, ground water from the bedrock and the overburden is hard to very hard and contains acceptably low concentrations of iron, chloride, sulphate and nitrate. The iron concentration in the water from well 10 was 0.65 ppm which exceeded the OWRC maximum recommended limit of 0.3 ppm. However, this could be attributed to sediment in the sample.

FAVOURABLE TEST DRILLING AREAS

The selection of favourable test-drilling areas is shown on Drawing 2548-1 and is based on an evaluation of hydrogeologic data contained in this report. It appears that the bedrock aquifers in the area could have the potential to yield sufficient supplies to meet the water requirements of the village. The test-drilling areas have been selected near the Saugeen River because of the possibility that a greater degree of enlargement of the fractures in the

bedrock by solution may occur in discharge areas. Areas near the village oxidation pond and sanitary landfill site have been avoided to reduce the possibility of inducing infiltration of fluids from these sources which could affect the quality of well water.

The bedrock valley beneath the Saugeen River contains unconsolidated sediments up to 60 feet in thickness. The potential of these deposits to yield large supplies of water is unknown and could be tested.

The yield from any overburden or bedrock well may be increased if infiltration can be induced from the river by reversing the natural ground-water gradient by pumping.

It is estimated that four test wells would be required to adequately test the favourable areas. Test wells should penetrate to the shales of the Cabot Head formation in order to test the entire Guelph-Amabel geologic section.

CONCLUSIONS

1) Ground-water conditions in the vicinity of the Village of Markdale appear to be favourable for locating a well or wells capable of supplying the community requirements.

2) The bedrock appears to offer the best potential for yielding large supplies. Aquifer development in the

limestones and dolomites of the Guelph formation and the Amabel Group of formations is attributed to fracturing and jointing in the rock.

3) Studies indicate that the areas most likely to yield a well capable of delivering 250 gpm are located near the Saugeen River. Deep wells may encounter flowing conditions in these areas.

4) The chemical quality of the ground water in the Markdale area appears to be satisfactory for municipal purposes.

RECOMMENDATIONS

If test drilling is undertaken it should be carried out in the areas recommended and shown in the attached drawing. Where favourable hydrologic conditions are encountered, extended pumping tests should be carried out to provide the hydrologic data necessary to determine well yield, aquifer coefficients and the degree of interference with local wells. Water samples should be taken frequently during test pumping to determine the bacterial and chemical quality of the ground water.

All of which is respectfully submitted,

Prepared by: P. F. McKenna, Geologist,
Surveys and Projects Branch.

PFM/lb
19/08/70

.....
T. J. Yakutchik, Supervisor,
Surveys and Projects Branch,
Division of Water Resources.

AREA OF SURVEY MARKDALE.
COUNTY OF GREY.

ONTARIO WATER RESOURCES COMMISSION
TABLE OF WATER WELL RECORDS
TABLE 1

DATE March 1970.
RECORDER Lck.

Well No.	Location	Con.	Lot	Owner	Driller	Well Type	Well Diameter Inches	Depth Ft.	Static Level Ft.	Pumping Rate GPM	Pumping Level Ft.	Quality	Use	Remarks, Log, etc.	
1.	VILLAGE OF MARKDALE			EDWARD DRONE 25-113.	KEN MIGHTON. JUNE 7/64.	●	4	140	35.	8 Hrs @ 10.	36.	F	D,S.	OPEN HOLE. HD STY. GR. SD GR. CLAY GR. F. GR. SD GR. GY ROCK. W-132'-138'.	0-9 94-50 50-60 60-75 75-80 80-115 115-14
2.	ARTEMESIA TOWNSHIP	IE	10	AUBREY FOSTER. 25-114.	PRATT BROS. SEPT. 4/54.	●	4	98	30	24 Hrs @ 10.	35.	F	D.	SDY CLY HP. BR LS. YEL CLSH. W-74'	0-3 30-9 40-7 74-7
3.	" "	TIE	10	G. QUIGLEY. 25-121.	A. GILRAY. NOV. 25/49.	●	6	49.	20.	—	—	CLEAR F.	D,S.	CL SH. RK RK. W-49'	0- 10-1 15-4
4.	" "	TIE	116	C. J. FOSTER 25-131.	A. LOUCKS JUNE 21/61.	●	5 3/8	64	27.	3 Hrs @ 5.	34	F	D-	STS. BR CLY SF. WH LS. W-45'-64'	0- 30-6
5.	EUPHRASIA TOWNSHIP.	XII	1.	MRS. CARMAN BROWN. 25-1122	ALLAN LOUCKS. DEC. 19/67.	●	5	80.	30.	16 Hrs @ 10.	40.	F	D,S.	GR BLDS. LS. W-76'-80'.	0-58 58-8
6.	HOLLAND TOWNSHIP.	IE	92	R.W. MACDONALD 25-1449.	PRATT BROS. APRIL 29/63.	●	4	66	11	4 Hrs @ 7	15.	F	D.	SD. SD GR HP. GR. W-66'.	0-1 18-6 60-6 65-6
7.	" "	IE	91	JACK EAGLES. 25-1448.	ALLEN LAUCKS. July 2/64	●	4	92	40	8 Hrs @ 12	60.	F	D.	YEL GR. BLDS YEL LS. W-85'-92'.	0-8 85-9

AREA OF SURVEY Markdale.
COUNTY OF Grey.

ONTARIO WATER RESOURCES COMMISSION

TABLE OF WATER WELL RECORDS

TABLE 1

DATE March, 1970.
RECORDER Lek.

Well No.	Location	Con	Lot	Owner	Driller	Well Type	Well Diameter Inches	Depth Ft.	Static Level Ft.	Pumping Rate GPM.	Pumping Level Ft.	Quality	Use	Remarks, Log, etc.
9	Holland Township.	IE	54	H. Blenkiln 25-1447	Allan Lowes. Sept. 20/65.	●	4	73.	45.	7 Hrs @ 8	60.	F	D.	Gr. Blds. 0-6. Ls. W-70'-73'. 69-73
3	Glenelg Township.	IW	106	Henry Pope 25-1300.	Durham Drillers Nov 30/62.	●	5	62.	15	2 Hrs @ 30.	20.	F.	D.	Blds. 0-. Sd. 10-2. Bl Cl. 20-4. Sd. 45-4. Wh Rk. 48-6. W-55'-60'
10.	" "	IW	90	Alvin Foster (Tenant Mrs R Brickland) 25-1301	M. Bellerby June 23/51.	●	4	138	20	1 Hr @ 7.	30.	F	D.S.	Dug Well 0-. Sd Cl. 21-1. Ls. Rk. 111-1. W-138'
11	" "	IW	105	Gordon J. Hamilton 25-1302	M. Bellerby. Aug. 14/52.	●	4	69.	20.	1 Hr @ 6 2/3.	20.	F.	D.S.	Dug Well 0-. Sd Gr. 20-2. Wh Ls. 29-6. W-69'
12	" "	IW	135	Bar Hero School House. 25-1303.	M. Bellerby. Aug. 27/53.	●	4	130	22.	3 Hrs @ 5.	30.	F	School	Sd Rough Gr. 0-. Brn. Rk. 30-6. Rk Ls. 65-1. W-130'.
13	" "	IW	107	Roy Love. 25-1304	Pratt Bros. Sept. 10/54.	●	4	49.	6	2 Hrs @ 20.	16.	F	D.S.	Sd Cl. 0-. Wh. Ls. Rk 14-. W-49'
14.	" "	IW	101	A. Van Curten. 25-1305.	E.J. Pratt & Sons July 18/55.	●	4	75.	3	5 Hrs @ 6.	18	F	D.	Rk Cl 0-. Wh Ls. Rk (very wh.) 12. W-75'
15.	" "	IW	110	Cedar View Farm M. Patterson. 25-1306	M. Bellerby. Aug 11/53.	●	4 3/8	117.	60.	4 Hrs @ 5.		F	D.S.	Sd. Gr. 0-11. W-117'.

AREA OF SURVEY Markdale

COUNTY OF Grey

ONTARIO WATER RESOURCES COMMISSION

TABLE OF WATER WELL RECORDS AND SOIL TEST BORINGS. TABLE I

DATE March, 1970

RECORDER Eck

Well No	Location	Con	Lot	Owner	Driller	Well Type	Well Diameter (Inches)	Depth (Ft.)	Static Level (Ft.)	Pumping Rate (GPM)	Pumping Level (Ft.)	Quality	Use	Remarks, Log, etc.
16.	VILLAGE OF MARKDALE			MARKDALE CONSOLIDATED 25-1065	A. SEMERAU #A.1 23/65.	●	5"	34'	WILL NOT TEST	TAKE X 5 GPM		NO TEST.	C.	SOY GR. CL. 0-9 HARD GR. LS 43-44
17	" "			MELVIN WARD	R. LOUCKS Nov 12/64	●	4	70	2	3 Hrs @ 10	23	F.	D	GR. BLDR. 0-1. LS 12-7 W-50'-70'
18	" " MAIN ST.			BORE HOLE #1.		□								SILTY SO GR. (MOIST OPEN BN.) 0-15 SOY SILT FILL - (DENSE BN. FREQUENT) 15-50
19.	" " LORNE ST.			BORE HOLE # 8		□								DRY SO. & GR. 0-1 SOY SILT. 15-2 MOIST TILL F. REG. GR.) 28-4
20.	" "			BORE HOLE #11		□								CL SILT 0- SOY SILT TILL 8-3 (DENSE BN)
	EASEMENT "A"													SILT (BN) 38- SO & GR. 56-6 SOY SILT TILL 66-1 (DENSE BN)
21.	" EXISTING " ROAD			BORE HOLE #17.		□								SILTY SO GR. (DENSE BN. WET) 0-4. PEAT. 4-9 WATER. 9

C

ONTARIO WATER RESOURCES COMMISSION

TABLE OF WATER ANALYSES

TABLE 2

AREA OF SURVEY MARKDALE

DATE MAY 6, 1970

Source and Number	Location and Owner	Date Sampled	Temperature in °F	pH at Lab.	Mineral Constituents in parts per million (ppm)											Alkalinity as ppm $CaCO_3$	Hardness as ppm $CaCO_3$		Total Dissolved Solids in ppm	Specific Conductance (micromhos at 25°C)	Remarks
					Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Carbonate (CO_3)	Bicarbonate (HCO_3)	Sulphate (SO_4)	Chloride (Cl)	Iron (Fe)	Fluoride (F)	Nitrate as N		Total	Calcium			
WELL #16	MARKDALE COIN LAUNDRY	17 MARCH 70		7.2			3	1.1			14	7	0.05	0.0	2.4	268	290				Penetra. 43' overb. 57' bedr.
WELL #6	R.W. MACDONALD	17 MARCH 70		7.6			2	0.6			12	5	0.05	0.0	.60	244	258				Overburd well, 60 dup'm.
WELL #10	ALVIN FOSTER	17 MARCH 70		7.8			3	0.9			16	5	0.65	0.1	.03	236	242				Penetr. 111' overb 27' bedr.
WELL #13	R. LOVE	17 MARCH 70		7.3			9	3.9			21	10	0.05	0.0	5.8	379	414				Penetra 14' overl 35' bedr
WELL #12	AUBREY FOSTER.	17 MARCH 70		7.5			7	0.7			13	13	0.05	0.0	2.6	261	286				Penetra 40' overl 36' bedr

DIVISION OF WATER RESOURCES

SURVEYS AND PROJECTS BRANCH

STANDARD ABBREVIATIONS

Materials

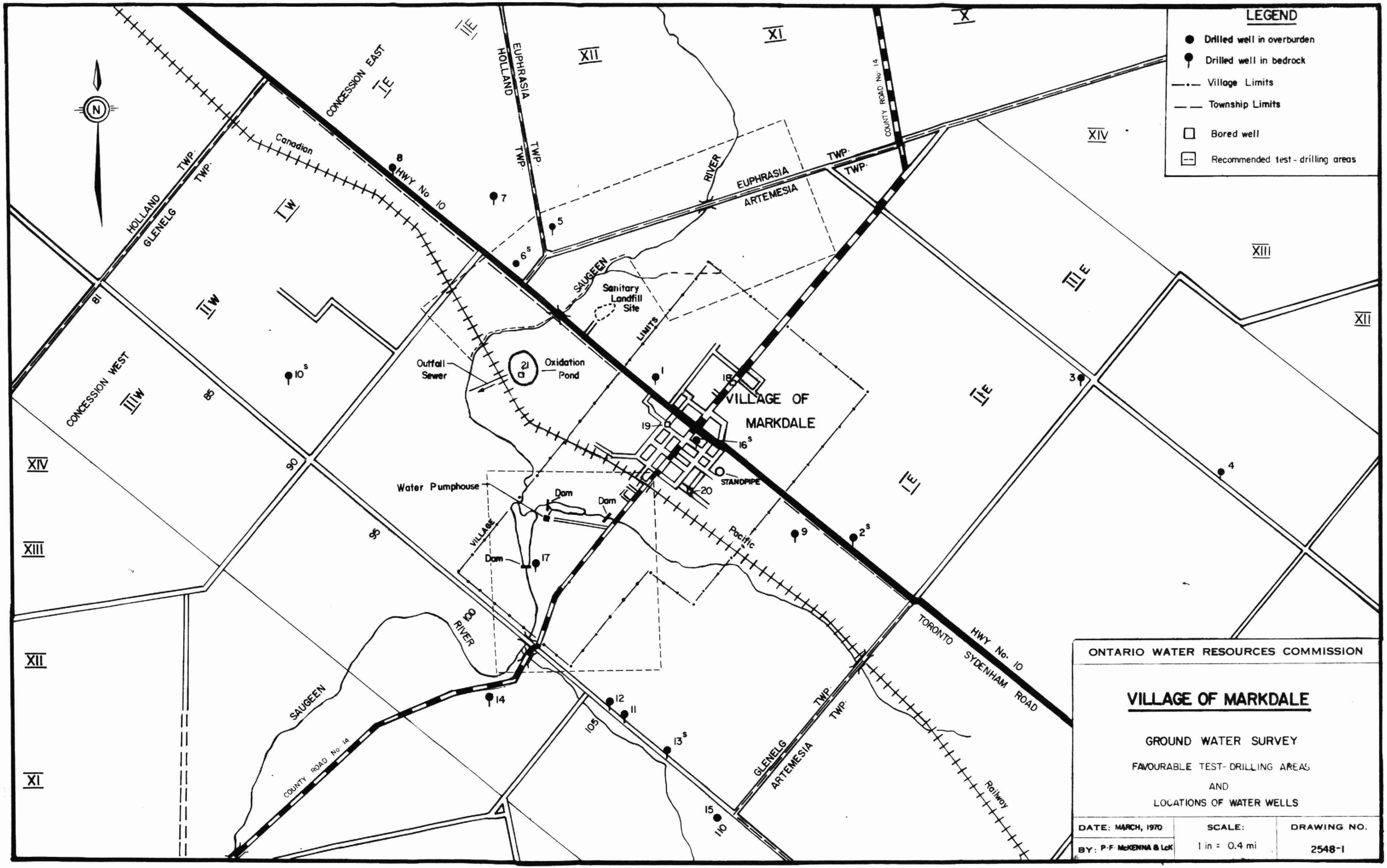
Bld	-	boulders
Cl	-	clay
Gr	-	gravel
Hp	-	Hardpan
Pbl	-	pebble
Qsd	-	quicksand
Sd	-	sand
Slt	-	silt
Sts	-	stone(s)
Ts	-	topsoil
Cht	-	chert
Dol	-	dolomite
Gte	-	granite
Gnst	-	greenstone
Ls	-	limestone
Rk	-	rock & bedrock
Sh	-	shale
Ss	-	sandstone

Water Use

Ab	-	abandoned
C	-	commercial
D	-	domestic
In	-	industrial
Irr	-	irrigation
M	-	municipal
P	-	public supply
S	-	stock
Th	-	test hole
Tw	-	test well

Description

Cem	-	cemented
Cln	-	clean
Clr	-	clear
Cly	-	clayey
Cse	-	coarse
Dk	-	dark
Dty	-	dirty
Lt	-	light
F	-	fine
Fr	-	fresh
Gry	-	gravelly
Med	-	medium
Hd	-	hard
Lay	-	layer(s)
Lse	-	loose
Lge	-	large
Min	-	mineral
Sa	-	salty
Sdy	-	sandy
Shy	-	shaly
Slty	-	silty
Sm	-	small
Sf	-	soft
Str	-	streak(s)
Sty	-	stony
S	-	sulphur
Bf	-	buff
Bk	-	black
Bl	-	blue
Bn	-	brown
Gn	-	green
Gy	-	grey
Pk	-	pink
W	-	water or waterbearing
Wh	-	white
Yl	-	yellow
Ob	-	overburden


LEGEND
Drilled well in overburden
Drilled well in bedrock
Village Limits
Township Limits
Bored well
Recommended test-drilling areas
N
CONCESSION EAST
CONCESSION WEST
HOLLAND TWP.
GLENELG TWP.
EUPHRASIA TWP.
ARTEMESIA TWP.
HWY No 10
TORONTO SYDENHAM ROAD
COUNTY ROAD No 14
RIVER
SAUGEEN
Canadian Pacific Railway
Sanitary Landfill Site
Outfall Sewer
Oxidation Pond
Water Pumphouse
Dam
STANDPIPE
VILLAGE OF MARKDALE
VILLAGE LIMITS
81
85
90
95
100
105
110
I W
II W
III W
I E
II E
III E
XI
XII
XIII
XIV
1
2S
3
4
5
6S
7
8
9
10S
11
12
13S
14
15
16S
17
18
19
20
21
ONTARIO WATER RESOURCES COMMISSION
VILLAGE OF MARKDALE
GROUND WATER SURVEY
FAVOURABLE TEST-DRILLING AREAS
AND
LOCATIONS OF WATER WELLS
DATE: MARCH, 1970
SCALE: 1 in = 0.4 mi
DRAWING NO. 2548-1
BY: P.F. McKENNA & LcK